

TECHNOLOGY FORECAST - 1982

Environmental/Health Factors

Overview: Key assumptions for forecasting the environmental exposures, requirements and possible technology opportunities in the 1980's and beyond include: public opposition to substantive relaxation of environmental and health regulations; increased regulatory emphasis on enforcements; increased health-science testing of new and existing products; moderating pressure to pass new laws at the federal level; increasing state initiation to pass technology-forcing regulations, increasing liability for hazardous substance releases, limited availability of secure waste disposal sites and increasing administration of federal programs at and by state and local governments.

Changes to the Clean Air Act are likely to be more cost-effective refinements which will improve procedures to make permit procurement less burdensome rather than a revolutionary overhaul of air quality standards and control technology requirements. State responsibilities will increase. New ambient standards possibly will emerge for short-term NOx, fine particulates and hazardous/carcinogenic air pollutants. Increased emphasis on compliance with current rules and implementation of noncompliance penalties can be expected, especially by states seeking to raise revenue.

EPA will continue to develop more stringent industrial effluent water quality requirements short of a zero discharge target, but they will experience difficulty in promulgating valid guidelines such that Congress will be forced to extend the current July 1, 1984 deadline for installation of Best Available Technology (BAT) for control of industrial discharges. Increased emphasis on enforcement of current rules and standards will be seen. The possibility exists that BAT will not impose a significant additional capital burden beyond best practicable technology (BPT) standards now in effect.

An overhaul of EPA's complex hazardous waste management regulations can be expected because of current regulatory reform efforts. While this should benefit the petroleum industry greatly, discarded oils and oily wastes may become listed as hazardous wastes resulting in substantial new disposal burdens. Increased groundwater monitoring for disposal sites will result in new environmental exposure and safeguards imposed on industry.

Health risk assessments on new and some existing products including their combustion products will become important. Occupational health issues will require development and maintenance of extensive data on workplace exposures to supplement product toxicology information. Medical surveillance will also be expanded. ✓

Technologies which will become more prevalent include:

- Increased use of flue gas scrubbers for SOx control, with more emphasis on dry scrubbing and byproduct recovery systems.
- Combustion modifications to reduce NOx on refinery boilers and process heaters with limited application of catalytic and non-catalytic flue gas treatment
- Increased application of electrostatic precipitators and baghouses for particulate control (especially fine particulates)
- Partial recycle of refinery effluent to refinery cooling water systems
- Increased use of non-chromate corrosion inhibitors
- Improved sampling systems to allow better utilization of emission monitoring instrumentation
- Additional reclamation methods for waste materials
- Improved groundwater monitoring techniques with priorities given to waste disposal sites and underground product storage tankage.

Forecast Assumptions:

General

1. Public opposition will prevent any major relaxation of existing environmental and health laws and regulations for the petroleum refining and marketing industry.
2. Increased enforcement particularly by state jurisdictions to assure continuous compliance with environmental and health regulations.
3. Insurance to cover sudden and non-sudden environmental release liability will be available.
4. Economic incentives and other "free market" alternatives will begin to be substituted for some current regulatory programs.
5. Increased toxicological testing of existing and new products will be required.
6. Environmental and occupational health control technology will be available.
7. Introduction of significant number of motor vehicles which are designed for oxygenates.

Federal

8. Moderating pressure to pass substantive new laws at federal level. Emphasis on revisions to existing laws to improve cost-effectiveness without significant environmental/occupational health degradation. Principals of acceptable risk and cost-benefit analysis will be factors in new rulemaking. States will be delegated more responsibility for implementing and maintaining federally enacted regulations.
9. Industry faces increasing liability and significant financial exposure including third party claims for imminent hazards from abandoned waste disposal sites and releases to the environment.

State

10. Increasing state initiative to adopt new technology forcing regulations requiring hazardous substance and waste management of releases to the environment, as part of increasing state responsibility for implementation of federal programs.
11. Existing waste disposal sites limited in number with local pressure in some geographic areas to close. Permitting of new sites will be time consuming and difficult.
12. Labor unions and environmental groups more active in lobbying and litigation at state, local levels to offset perceived loss of effectiveness at federal level.
13. State/local jurisdictions will attempt to generate additional operating revenue from industry from environmental programs.

Air Quality:

Near Term (up to 1987) - Compliance with existing and new regulations will be more vigorously enforced by states and localities to the levels they are able to fund these enforcement programs. Increased and more accurate self-monitoring information and data retrieval systems for reporting requirements will be necessary to minimize exposure to penalties for noncompliance, and to obtain data for permit applications.

The Clean Air Act review will be completed by Congress, probably in 1982. Possible changes to the Act and resulting regulations are not apt to ease the trend of tighter emission control requirements for both existing and new facilities in selected areas, particularly if mobile source standards are relaxed. States will be given more authority which will result in less duplication of effort between federal, state and local jurisdictions, but significant differences among state programs will require facility-specific programs with few opportunities for industry to consolidate its efforts. Procedural changes and improved and consistent source definition are likely to allow shorter federal permitting time in both clean air and non-attainment areas. Directionally, the 1982 amendments will attempt to improve

cost-effectiveness of environmental control without degrading the progress achieved to date. Expanded use and scope of the "bubble" concept, introduction of emission reduction incentive programs as substitutes for some overly complex regulations, and marketing of emission permits will be experimented with in some areas. The net benefits of Clean Air Act changes to industry will be dependent on state requirements.

Regulations will continue to require use of actual emissions as averaged over the near term as the baseline for determination of the net emission increase of a new or modified source. By this mechanism, control agencies will continue to ratchet down permitted emissions and to require increased controls for new sources.

National Ambient Air Quality Standards (NAAQS) may be promulgated for particles in the respirable range. If NAAQS are promulgated for short-term nitrogen oxides, an industry challenge is likely.

The procedures for setting the NAAQS will likely change in that more scientific review will take place. No significant change for most pollutants is expected. Moderation in allowable frequency of exceedences is likely which would reduce the number of non-attainment areas. Attainment dates will be dictated by states. Some generic carcinogenic and other hazardous NAAQS may be promulgated in the next five years. In some cases, such as California, state AAQS will continue to be more restrictive than NAAQS, requiring additional emissions controls. More emphasis on point source equipment emission control and air quality monitoring is expected. Improved understanding and utilization of more sophisticated dispersion models will be required. The modeling effort necessary for permits may increase.

Long Term (post-1987) - Additional controls can be expected on fuel sulfur SO_x, NO_x and total suspended particulate on a regional basis for controlling acid rain and fine respirable particulates. Political expediency may force unnecessary stringency on the sulfur and NO_x related controls. In addition, EPA pressure on state agencies to develop plans to bring noncompliance areas into compliance or to control air pollution episodes will result in more stringent controls on selected pollutants. As new health effects information is collected on various materials, the list of toxic and carcinogenic materials requiring controls will increase. Facility NSPS will be promulgated by EPA for alternate fuel production facilities requiring adaptation of refinery control technology. Noncompliance fees and penalties will be increasingly applied to sources not meeting regulatory requirements. Control equipment must be able to maintain a prescribed compliance level, i.e., incineration at proper temperature and reliable operation of Claus tail gas units.

Air Quality Refining (Primarily Near Term):

Gasoline/Diesel Fuel Sulfur - It is unlikely that a national gasoline sulfur standard will be enacted within the next five years. In California, CARB has relaxed its enforcement of the 300 ppm sulfur limitation on gasoline until January 1, 1982. Further relief from CARB is unlikely. The CARB has enacted a regulation requiring all diesel fuel sold in the South Coast Basin to have a maximum sulfur content of 0.05 wt. %, starting in 1985. Litigation is probable.

Lead and Alternate Anti-Knock Additives - Alkyl lead manufacturers are lobbying extensively for relaxation of the federal lead phasedown schedule. The schedule currently in effect will probably be relaxed.

MMT - Currently MMT usage is prohibited in unleaded gasoline. Ethyl Corporation has refiled for a fuel additive waiver at 1/64 gm/gal level. EPA's decision will be forthcoming by the end of 1981. If approved, MMT is expected to compete with oxygenates as an octane enhancer. Technical data base appears to support approval.

Oxygenates - Aliphatic alcohols and ethers have become important as gasoline blending components because of their high octane value. The oxygenates of primary interest are methanol, gasoline grade ethanol, tertiary and n-butanol, furfuryl alcohol, and MTBE. Environmental impediments to the use of oxygenates have been reduced through recently promulgated fuel/fuel additive regulations (waivers and Substantially Similar Interpretive Rule). Within the next five years, even broader allowances are expected. For example, methanol usage in the absence of a co-alcohol will likely be approved in unleaded gasoline up to 10% by 1987.

Water Quality (Near Term):

Surface Water - Delay has occurred in issuance of valid effluent limitation guidelines for many industries. Congress will be forced to postpone the deadline for installation of Best Available Technology (BAT) for effluent quality control. Postponement of the July 1, 1984 compliance deadline to July 1, 1987 would be consistent with the recommendations of the National Commission on water quality several years ago. BAT guidelines for refineries may be promulgated in 1982, but will surely be bound in litigation by API and member companies.

Improved analytical techniques will establish even lower detectable limits for toxic substances which will provide EPA with a convenient, albeit unjustified basis for lower effluent limitations. To meet the anticipated regulatory requirement, there will be continuing effort to reduce water usage thru reuse, and to reduce effluent quantities and pollutant types, particularly toxic materials such as some of the heavy metals. Expanded effluent testing, including biomonitoring, will be required to assure compliance with NPDES permit criteria, and under the consolidated permit program.

Because of regulatory reform, some relaxation may occur in general pretreatment regulations for discharges to public treatment systems. However, specific requirements for refineries may be included with the BAT guidelines. Major capital expenditures for pretreatment would be required if refineries do not obtain relief.

For both pretreatment and direct discharge requirements, the possibility exists that BAT will not impose a significant additional capital burden beyond best practicable control technology (BPT) standards now in effect.

Present usage of gasoline grade tertiary butyl alcohol (GTBA) in gasoline can most likely be continued without major capital expenditures to treat tank water bottoms contacted with GTBA-containing gasoline. Expanded oxygenate usage in gasoline may require expenditures for recovery from tank bottoms at some facilities handling the materials. Oxygenate discharges from some terminals may need to be addressed in discharge permits.

Technology innovations and new applications of conventional controls which minimize discharge and maximize reuse/recycle will be required.

Groundwater - EPA may establish a National Groundwater Policy which will result in the need to conduct groundwater analysis prior to siting of new facilities as part of permit processing data requirements. Post facility start-up monitoring will be required to assure compliance with permit conditions relative to groundwater quality. Leakage detection methods will be required for existing facilities, including service station. Methodologies are currently under development to make this determination less difficult. In addition, modeling combined with soil analysis will play an important role in determining priority of testing.

Data base acquisition to measure groundwater quality will steadily increase. Where indicated, particularly if impacting drinking water supplies, remedial measures to improve groundwater quality or curtail sources of contamination will require capital expenditures at some refineries, bulk terminals, and service stations. Fingerprinting of refinery products will become increasingly important in assessment of ground water complaints and problems.

The prevention of groundwater contamination will also result in technology to monitor tank levels remotely on a continuous basis. Present systems are workable but are costly. New systems, based perhaps on fiber optics technology, will be developed to reduce the cost of this approach. Scheduled tank replacement programs will become widespread due to liability exposure and public concerns on drinking water contamination. Equipment standards to prevent leaks will be imposed.

Water Quality - Long Term (post 1987):

Surface Water - There will be significant strides made toward effluent water recycle/reuse in refinery operations. The treatment of recirculating cooling water will become more sophisticated as wastewater recycle is employed. Technology innovation will occur in treatment chemicals, water quality anal-

ysis and control techniques. There will be a trend toward decentralized water treatment facilities within refineries, tailored to specific effluent quality requirements for that part of the plant being serviced. Oil recovery systems will become more sophisticated as the value of crude increases.

Groundwater - Extensive groundwater monitoring well networks will be in place to detect threats to aquifers. Efforts to cleanse contaminated aquifers will be moderately successful although costly with new technology innovation. Groundwater recharging with reclaimed municipal treatment plant effluent will be limited by concerns about long-term low level health effects of remaining contaminants. Land use planning will emerge as the mechanism to protect the groundwater resource for potable supply.

Waste Disposal:

Near Term (up to 1987) - EPA will conduct an extensive overhaul of their hazardous waste management regulations. Regulatory movement, particularly by states, with a "degree of hazard" approach should be helpful in reducing the great burden on manufacturing facilities apparent in the current regulatory framework. This will be advantageous to refineries with relatively low hazard characteristics.

Legislators and regulators will increase pressure to implement fail-safe high-technology waste management as a substitute for land disposal. However, land treatment will remain a viable disposal option.

Planning to conduct remedial projects and explore alternatives to current waste management practices and facilities will be needed.

Some refinery wastes have been listed by EPA as hazardous, chiefly based on arbitrary EPA testing. Used oil may be listed as a hazardous waste. If this occurs the consequences will be large and industry will litigate. Industry effort will result in delisting of some of these wastes. Compliance with waste management criteria established by RCRA will require substantial monitoring of onsite storage and disposal facilities.

Costs to refinery and marketing operations will be primarily transportation, packaging, and disposal charges for hazardous wastes. Houston, Cherry Point and Philadelphia will also have to obtain appropriate disposal containers and construct or retrofit approved storage and disposal facilities.

Costs for off-site disposal will increase significantly in the near term. Handling criteria may also be developed which will require product packaging specifications in addition to current industry practice to ensure proper ultimate disposal.

Some opportunities to reclassify wastes or use innovative technology to develop wastes as raw materials for other processes/industries will occur. Reuse, reclamation and recycle of waste materials (including "waste exchange") will receive regulatory "incentives" as part of technology forcing requirements.

"Ultrafund/superfund" and RCRA financial exposures for cleanup and perpetual care of abandoned or closed sites both at the federal and state levels will be significant. Abandoned sites previously owned/operated by the refining industry have been reported to EPA as part of federal superfund requirements. Federal/state legal actions forcing cleanup can be expected for sites identified as hazardous. Insurance companies already provide for sudden release liability and will underwrite coverage for releases over long time periods which have adverse environmental/health impacts. Premiums will be costly.

In many geographic areas approved existing landfill disposal sites will begin to reach their capacity limit. Public opposition could prevent the siting of new landfills.

Long Term (post 1987) - At some locations on-site incineration and/or other pretreatment may be necessary to minimize waste volumes and exposures to liabilities for transport to proper sites. A sufficient number of approved off-site disposal facilities may not be available. Permit timing for new disposal facilities will be approximately 2 years or more after application is made.

Intense pressure to minimize waste volume will necessitate increased emphasis on landfarming; refinery incineration; detoxification of those wastes which must be disposed off-site and significant new uses for materials to remove them from the regulatory definition of a waste. Wastes may be encapsulated in leach-proof containers for landfill disposal by burial in specified locations which may not be proximate to waste generator locations.

Genetic engineers will play a significant role in creating "antidotes" for selected wastes. Extensive waste characteristic and generation information exchange systems will emerge with related regulatory requirements giving rise to "waste brokerage" operations for reuse and recycle. New technology in waste handling/disposal will proliferate.